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New Technologies of Internet Employment: Reducing Costs With an Economic Value Model

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Abstract

This paper focuses on examining the effect of applying the classical model of the economic value of the order on the employment activities of human resources in an organization. Initially, based on the classical model, the economic value of the order is modeled and the value of unique costs of employment activities such as human resource management and related coordination is obtained. Thereafter, the status in the two cases before and after the implementation of this technology is compared and this situation is analyzed by providing a numerical example. The optimal costs of investment are increasing rapidly. On the other hand, the development of efficient technologies in the employment system has caused the total number of employees to be hired to always be higher than the minimum required level set in this model. Investment in this area has declined. The result shows that with the implementation of this technology, due to the reduction of existing costs, on the one hand, the economic value of order decreases and on the other hand increases the total optimal profit.

Keywords: Internet Employment Technologies, The Economic Value of the Order, Human Resource Management, Optimal Costs of Investment, Communication Technology

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1. Introduction

One of the fundamental changes in today's complex and dynamic world is the advent of information and communication technology, which brings many benefits. Despite the numerous potential benefits, the development and deployment of these technologies are not enough to enjoy these benefits (Çalışkan, 2015). Rather, technology must be accepted and used by users. On the other hand, in many cases, it can be seen that these technologies are not used properly and after a short time of use, they are generally discarded due to lack of proper use (Van Ark et al., 2016). If the entry of technology into the organization is accepted by its users, a more desirable efficiency will be achieved. If the new technology is not accepted and used by users, investment in the desired field will be fruitless (Mokyr et al., 2015). The digital economy based on internet technology has provided an important boost for economic growth. Internet technology progress directly promotes being employed in the industry. Inter-industry spillovers lead to positive effects of internet technology on employment in other industries and again on employment within one industry through various feedback loops between industries. Policy should promote internet technology in various industries, especially those closely linked to other industries to develop employment and growth (Wang et al., 2020). The digital transformation narrative emphasizes that digital technologies help firms become more productive and contribute to economic performance and competitiveness at the firm, regional, and national levels (Bertschek et al., 2013; Martinez-Caro et al., 2020; Norris, 2020; Tranos et al., 2020). Due to the importance of this issue, research has been conducted in this regard in different countries. The main concern of which is the adoption and use of new technology, and among the most important of them is information and communication technology (Mickoleit, 2014). All non-automated work will eventually be rendered redundant by digital technologies and robotics wokers. Based on a report by McKinsey Global Institute, at least a third of the activities in half of the occupations can be automated by 2030 (Manyika et al., 2021). Internet employment has brought many benefits such as no time and space restrictions, easy access to information, reducing the cost of services, and saving time for job seekers which has led to the rapid growth of the use of internet employment services (Marcolin et al., 2016). The use of internet employment services is one of the solutions to gain a competitive advantage for the job search firm and has caused close competition in this field. In such circumstances, the level of expectation of job seekers to receive such services has also increased (Frey & Osborne, 2017). Employment agencies have realized the importance of differentiating themselves from other sources of internet employment through new service distribution channels, as the use of new distribution channels increases access to job seekers (DeStefano et al.,

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2017). Thus, with the expansion of business thinking around the world, especially concerning the provision of reemployment services, job firms, due to their special nature, are more efficient users in using online technology (Bessen, 2015). According to Toffler, in the developed age of information and knowledge, there is a need for greater change in society. At present, human beings have started a new era in which most things, including employment in that society, need to be done virtually (Berlingieri et al., 2017). Therefore, the introduction of information technology and especially the internet in the employment industry has changed the competitive environment of this industry. Given the vast changes in global markets and increasingly fierce competition, the global customer interaction experience online is a differentiation strategy. Online hiring is a way to reduce costs and stay competitive compared to traditional hiring (Autor, 2015). Internet recruitment is a growing phenomenon all over the world, especially in countries where the appropriate infrastructure for online recruitment is well developed. According to the latest statistics of the World Telecommunication Union, Iran currently has an internet penetration rate of 10.8 percent and this is in the context that the average internet penetration rate in the world is estimated at 16.7 percent. The estimated number of internet users in Iran in 2000 was about 250,000, which can be compared to the current estimate published in the second half of 2008. The number of internet users in Iran has grown by more than 9100% over eight years. Furthermore, the highest growth of internet penetration rate in the period (2000 to 2008) belonged to Iran, Syria, and Saudi Arabia with percentages of 9100%, 7006%, and 3000% (Arntz et al., 2016). The development of information technology and the use of new tools and concepts provide information expansion and easy and low-cost access for people and facilitate the rapid exchange of information and cultural interactions (Peters et al., 2014). For example, the ability of customers to access employment services without physical presence with a secure connection and by reducing the time of receiving services is one of the consequences of information technology, which in turn increases productivity.

Therefore, the present study was conducted with the aim of developing the model of the economic value in order to reduce the costs of new technologies for internet employment.

2. Theoretical Foundations and Research Background

Internet employment is one of the important phenomena resulting from the use of information and communication technology as well as information management. This has had a profound change in the way of hiring and employing human resources, so that on the one hand it increases the level of communication with job seekers and on the other hand it has expanded some job seekers (McGowan et al., 2017). Information technology encompasses all

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advanced technologies, how to communicate and transfer data in communication systems. This system can be a telecommunication network with several computers connected to and connected to the telecommunication network, the internet, as well as the programs used in them (Ahmad & Schreyer, 2016). Undoubtedly, information and communication technology has brought about wide-ranging changes in all social and economic spheres of humanity, and its impact on human societies is such that the world today is rapidly becoming an information society. This is a society in which knowledge and the level of access and beneficial use of knowledge plays a pivotal and decisive role. The wide range of applications and their effects on various aspects of life today and the future of human societies has become one of the most important topics in the world and has attracted the attention of many countries (European Commission, 2017). The online recruitment process begins with submitting the requested organizational posts on a company website or online recruitment sites that allows applicants to submit their resumes electronically via form or email (European Commission, 2016). Therefore, internet employment in the company improves the process and speed of doing things (Cooper et al., 2016). One of the results of the growth of internet employment technologies has been easier and more efficient job search (Brynjolfsson & McAfee, 2014). Internet recruitment has emerged as a useful method more than traditional recruitment methods in this field (Bowles–Bruegel, 2014). In addition, with the advancement of technology and the emergence of methods that facilitates and increase the process and operations of companies, now global companies use the (.com) domain as a development tool that defines a dedicated website for hiring job seekers. These domains provide a direct route for easier access to available job opportunities for seekers. DotJob is a unique domain because the organization puts part of its name in the domain name at the time of registration. For example, the domain (www.shrm.jobs) provides a simple, fast, and compatible way for the HRM to establish a direct online connection between the organization's recruitment page and job seekers using the internet (Autor, 2015). The importance of internet employment has also been recognized in Asia, and developing countries in Asia have benefited from a steady pace of internet employment. Managers of companies in Malaysia believe that internet employment can lead them to a new competitive position in the regional labor market due to the importance of workers' knowledge and resource-based competition (Arntz et al., 2016; Kenney & Zysman, 2016). Similarly, Pakistani employers have confirmed the validity of this claim and acknowledged the significant impact of online hiring on their business processes (Jäger et al., 2015). Web-based businesses in Iran have been slowly expanding in the last 15 years. The development of information and communication technology-based tools in the country has been effective in

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creating e-commerce. Examples of online job searches in Iran are increasing recently and this issue shows the need for the community to use web job search services in the information society (Butzin et al., 2014). Reasons such as lower investment costs, shorter hiring cycle, reaching a wider range of applicants, better quality of applicants, an opportunity to target a specific market, and attracting passive job seekers can be potential reasons for using online hiring (Heckman et al., 2013).

In line with this discussion, it showed that key factors that are important to the job applicant can include job duties, the company itself, opportunities for advancement, potential relationships with colleagues, salary, and job security (Harrison et al., 2014). Some relevant research has also shown that the level of salary, the opportunity to acquire knowledge and skills, and the challenging and interesting nature of the job have a significant impact on the applicant's decision to accept a position (Greenan & Guellec, 2000). In many studies, the effect of advertising on job selection shows that more than 20% of job seekers simply rejected the job opportunity due to poor website design (Michaels, 2015). There is also the fact that in the case of job search companies, website management is part of the success of the online recruitment process. Furthermore, many websites with highly sophisticated designs have lost about three-quarters of all job seekers (Goos et al., 2014).

Findings in other studies also show that providing accurate information about the job has also played an important part in requiring the applicant to use the website and submit an application for a suitable job (Friedman, 2014). In addition, it is shown that organizational advertising is the only predictive tool that shows significant ongoing direct effects on the number of applicants and the quality of their performance (Frey & Osborne, 2017). Therefore, by examining the above literature in addition to the fixed costs set in organizations, the use of these new tools imposes additional costs on the body of the organization. Investigating and determining the minimum amount of these costs is one of the main objectives of this article and has shown that with a simple development in the method of economical order quantity, these costs can be reduced to the lowest level in the management organization (Ford, 2015).

3. Proposed Research Model

This study examines the components of fixed employment costs, demand-based recruitment coefficient, surplus costs, and labor shortages. This research is applied in terms of purpose and descriptive survey in terms of implementation. The data obtained from this study were analyzed using descriptive and inferential statistics.

In this article, the process of online recruitment is defined as a broad company with employment activities and methods that use a variety of online

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tools throughout the recruitment process. Over the past decade, companies have invested heavily in online hiring technologies to reduce investment costs and improve the hiring process. Hence, the content of this article has shown internet employment technologies to be cost-effective and efficient in internet employment. These studies provide the best descriptive results and examine the trade-off between investment costs and benefits that has not yet been clearly defined.

Various studies of large IT companies show that many business organizations invest heavily in IT but rarely achieve higher financial returns. To fill the gap in the content of this paper, an economic decision model for investing in internet recruitment technology and analyzing the relationship between investing in internet recruitment technology and total recruitment costs is presented. This model allows the conditions under which it is better for the company to invest in online recruitment to be identified and to gain a better insight into the various reasons why private companies decide to invest in recruitment systems.

The selection of the proposed model has been done with the help of search engine rankings and the selection of the most visited job search website in Iran. Research to reduce the cost of hiring shows that most companies, such as the company selected in this study, have considered the cost of hiring as a fixed variable. Therefore, this has been the subject of discussion in this study because it is not always a fixed numerical value and other components. It has also played a key role in this amount, which is further developed by expanding this issue and combining a new variable that includes other possible costs.

3.1. Formulation of Economic Employment Decision Model

Mathematically, the cost of hiring in each recruitment cycle is defined as follows:

$$RC = C_e T_e (N_e / 2)\theta + C_s T_s ((N - N_e) / 2)\theta + C_a + C_c N \quad (1)$$

The total cost of hiring new staff over a planning period is then derived by:

$$Min\ TRC = \frac{C_e N_e{}^2 T\theta}{2N} + \frac{C_s (N - N_e)^2 T\theta}{2N} + \frac{C_a E}{N} + C_c E \quad (2)$$

Taking N_e from the first derivative according to Equation 2, and setting its value to zero and solving it, the optimal value N_e^* is given as:

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$$N_e^* = N \frac{C_s}{(C_e + C_s)} \tag{3}$$

By substituting the term N_e^* in TRC and taking the first derivative of Equation 4 in terms of N, and equating its value with zero and solving the equation, the desired number of employees to be recruited in each cycle N^* is obtained.

$$MinTRC = \frac{C_e N \left[\frac{C_s}{(C_e + C_s)}\right]^2 T\theta}{2} + \frac{C_s N \left[\frac{C_e}{(C_e + C_s)}\right]^2 T\theta}{2} + \frac{C_a E}{N} + C_c E \tag{4}$$

$$N^* = \sqrt{\frac{2C_a E (C_e + C_s)}{C_e C_s \theta}}, \quad (T = 1) \tag{5}$$

4. Results

4.1. Development of Economic Decision Model for Investing in Internet Job Search Technology

In the previous employment economic decision model, the fixed cost of employment is assumed to be fixed. In this section, it is assumed that the exponential function is grounded so that the cost of investing in *S* internet employment reduces the fixed cost of hiring. Billington proposes a similar exponential function with the basis for determining the optimal investment cost to reduce start-up costs in the classical model of the economic value of the order. Porteus has proposed a model for the economic value of the order in order to study the optimal investment to reduce the start-up cost for both the logarithmic function and the power-up cost function. In this paper, Equation 2 has been developed in order to include the investment costs *S* mentioned in the research literature and its results are shown in Equation 6.

$$MinTRC = \frac{C_e N \left[\frac{C_s}{(C_e + C_s)}\right]^2 \theta}{2} + \frac{C_s N \left[\frac{C_e}{(C_e + C_s)}\right]^2 \theta}{2} + \frac{C_a E}{N} + C_c E + S \tag{6}$$

The exponential investment function is defined for the reduction C_a in Equation 7 below.

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$$C_a = L + (H - L)e^{-\lambda S}, S \geq 0 \quad (7)$$

As H is the highest fixed cost of hiring, there is a time when no investment in online hiring technologies has been made and L as the lowest fixed hiring cost will be achievable by S investment. In order to obtain the optimal solution for investing in technology, the first derivative of Equation 6 is taken with respect to S and then equated to zero and solved. The results are equal to:

$$\frac{\partial TRC}{\partial S} = \frac{C_a{}'E}{N} + 1 \quad (8)$$

$$\frac{\partial C_a}{\partial S} = -\frac{N}{E} \quad (9)$$

The first derivative of Equation 7 is taken with respect to S and its results are equal to:

$$\frac{\partial C_a}{\partial S} = -\lambda(H - L)e^{-\lambda S} = -\lambda(C_a - L) < 0 \quad (10)$$

By equating Equation 9 and 10 and substituting the value of N in Equation 11 with Equation 5, Equation 12 is obtained. Then, by solving Equation 12, the optimal fixed cost C_a^* is derived through Equation 13.

$$-\frac{N}{E} = -\lambda(C_a - L) \quad (11)$$

$$\lambda E(C_a - L) = \sqrt{\frac{2C_a E(C_e + C_s)}{C_e C_s \theta}} \quad (12)$$

$$C_a^* = d + \sqrt{d^2 - L^2} \quad (13)$$

So:

$$d = L + \frac{(C_e + C_s)}{C_e C_s \theta \lambda^2 E} \quad (14)$$

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After obtaining the optimal fixed cost C_a^*, the optimal investment values S^* and N^* will be obtained through Equations 15 and 16 respectively.

$$S^* = \frac{\left(\ln \frac{(C_a^* - L)}{(H - L)} \right)}{-\lambda} \tag{15}$$

$$N^* = \lambda E (C_a^* - L) \tag{16}$$

In order to determine the minimum number of employees to be employed during a planning period for optimal investment, Equation 13 less than or equal to the value of H is solved and Equation 17 is formed.

It should be noted that the minimum number of employees derived from Equation 17 can also be calculated without the desired solution. Therefore,

$$\frac{2(C_e + C_s)H}{C_e C_s \theta \lambda^2 (H - L)^2}$$

can be used as a threshold value for investment decisions.

$$E \geq \frac{2(C_e + C_s)H}{C_e C_s \theta \lambda^2 (H - L)^2} \tag{17}$$

The Main Research Question: Is fixed cost of employment one of the effective components on internet employment?

Table 1. Investigating the Effect of Fixed Cost of Employment on Internet Employment

	β	β Standard	t	p-value	R	R^2	Regression significance test	
							F	p-value
Fixed value	2.372		8.269	0.001	0.366	0.134	18.682	0.001
Fixed cost of employment	0.347	0.366	4.322	0.001				

According to the value of F and p-value related to the main hypothesis of the research, which is less than 0.05, it can be inferred that regression is significant at the level of 0.05. The value of the coefficient of determination obtained from the test was equal to 0.134, and this coefficient of determination indicates that 13.4% of the changes related to the fixed cost of employment

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have been explained based on the implementation of internet employment. The correlation coefficient obtained from the test is positive and equal to 0.366. This result means that the relationship between these two variables is direct. In other words, the growth of online recruitment leads to performance development. Therefore, the respondents confirm the above relationship and consider the implementation of online recruitment to be effective in terms of performance.

The First Research Question: Is the demand-based recruitment coefficient effective on internet employment?

Table 2. Investigating the Effect of Demand-Based Recruitment Coefficient on Internet Employment

Regression significance test		R^2	R	*p-value*	t	β Standard	β	
p-value	F							
0.001	279.677	0.698	0.835	0.001 0.001	8.812 16.724	0.835	1.252 0.650	Fixed value Demand-based recruitment coefficient

Considering the value of F and p-value related to the first hypothesis of the research, which is less than 0.05, it can be inferred that regression is significant at the level of 0.05. The coefficient of determination obtained from the test is equal to 0.698, and this coefficient of determination indicates that 69.8% of the performance-related changes are explained based on the dimension of the absorption coefficient based on demand. The correlation coefficient obtained from the test is positive and equal to 0.835. This result means that the existing relationship is direct, i.e., the demand-based power absorption coefficient increases performance. Therefore, the respondents have confirmed the above relationship and believe that the demand-based recruitment coefficient has a significant effect on internet employment.

The Second Research Question: Does the effect of labor shortage affect internet employment?

Table 3. Investigating the Effect of Labor Shortage on Internet Employment

Regression significance test		R^2	R	*p-value*	t	β Standard	β	
p-value	F							
0.001	572.446	0.826	0.909	0.001 0.001	18.827 18.926	0.909	1.602 0.549	Fixed value Labor shortage

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According to the value of F and p-value related to the second hypothesis of the research, which is less than 0.05, it can be inferred that regression is significant at the level of 0.05. The value of the coefficient of determination obtained from the test is 0.826, and this coefficient of determination indicates that 82.6% of the changes related to performance are explained based on labor shortages. The correlation coefficient obtained from the test is positive and equal to 0.909. This result means that the relationship between these two variables is direct. In otherwords, labor shortages reduce performance growth. Therefore, the respondents confirm the above relationship and believe that managing labor shortages is effective for internet employment.

The Third Research Question: Does the effect of excess costs affect internet employment?

Table 4: Investigating the Effect of Excess Costs on Internet Employment

Regression significance test		R^2	R	*p-value*	t	β Standard	β	
p-value	*F*							
0.001	383.609	0.761	0.872	0.001	10.187		1.242	Fixed value
				0.001	19.586	0.872	0.622	Excess costs

Considering the value of F and p-value related to the question of the third hypothesis, which is less than 0.05, it can be inferred that regression is significant at the level of 0.05. The coefficient of determination obtained from the test was 0.761, and this coefficient of determination indicates that 76.1% of the performance-related changes are explained based on excess costs. The correlation coefficient obtained from the test is positive and equal to 0.872. This result means that the relationship between these two variables is direct. Therefore, the respondents confirm the above relationship and believe that the fashion of excess costs affects internet employment.

Conclusion

The purpose of this study is to assess the impact of different components of internet employment. In doing so, the components (fixed employment costs, demand-based recruitment coefficients, surplus costs, and labor shortages) were examined.

The labor market faced a number of challenges even before the advent of digitalization. A lack of job security, an extended workday or out-of-hours work, physical and mental illness, and lack of motivation or long-term unemployment are just some of the factors that influence people (Pirosca et al., 2021). According to the results of this study, online recruitment is effective

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in increasing performance. A growing number of large companies are now providing accurate job information on their professional job search websites in an effort to promote long-term relationships with job seekers, explain their work cultures and benefits, and explain the benefits they offer. Internet employment promotes growth and development in the industries, agriculture, and services of countries around the world. This model is very effective in reducing costs in the economy (Research Findings, 2022). Although online recruitment is extremely popular, there are few statistics available on the return on investment in various online recruitment technologies and the effectiveness of their management practices. As a complement to the previously described studies, which are mostly descriptive, in this paper, two analytical models of decision-making in the field of inventory management were presented based on the classical economic model of order (Research Findings, 2022).

By considering both the optimal investment in internet recruitment technologies and the decisions made in the initial model, the extended model of this study has developed the initial model. Managers can use the developed model to make good investment decisions in the employment systems of different organizations. The costs of making optimal investment decisions are determined by four main components: the fixed cost of employment, the recruitment coefficient, the surplus cost, and the labor shortage.

By including the unemployed, digitalization should aim to reduce the average working time. Either way, a less-stressful future lies ahead according to the general claim. Despite the fact that work has been conducted the same way in the past despite technological advancements, there are arguments that the digital revolution will bring about major disruption (Pirosca et al., 2021).

It is in many ways a revolution that the internet has transformed the way information is disseminated, exchanged, and presented.
Revolutionary in this sense means that economic, social, cultural, political, and technological principles were changed gradually.

Using this technology has many advantages, including streamlining processes and reducing costs.

Although, in this study, a basic exponential function is used as an investment function, other functional forms can be applied to the model, and optimal investment decisions can be made easily using computer software such as Excel software. As measured by the proposed model, the level of employment increases optimal investment costs more than before when investment costs are added to the initial model. Nonetheless, with more cost savings, this issue can also be reduced (Research Findings, 2022).

Based on the level of awareness, this is the first study to develop internet labor market investment models and analyze the cost savings for large employers as a result of internet employment technology. This study provided

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valuable insight into the advantages and costs associated with online hiring technologies. Managers will be able to make better investing decisions if they consider the proposed decision model and other complementary factors as well.

As a result, managing the superiority of online hiring technologies and processes is the key to obtaining a strategic advantage of hiring systems, not investing excessively in technology.

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